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ABSTRACT

This paper discusses the research findings in voice mutation, vocal instruction, and the application of knowledge to vocal instruction. Much research involves changes in the male and female adolescent voices, especially of interest to choral directors and music educators. The research defines the vocal development categories as: (1) posture; (2) breath management; (3) relaxation; (4) phonation; (5) resonance; (6) registration; and (7) articulation. A segment on therapy and exercise suggests ways to develop the voice that has been abused. An extensive list of references offers further topics for research. (EH)

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The Adolescent Female Voice: A review of Related Literature

Introduction

This article will present and discuss research findings in voice mutation, vocal instruction, and the application of knowledge to vocal instruction. Vocal pedagogues and laryngologists have studied the human voice extensively. The changing voice has been of particular interest to choral directors and music educators involved with adolescent students. Research in this area has been concerned primarily with the physical changes which accompany and affect voice mutation, the stages of the male changing voice, the stages of the female changing voice, and materials for choirs which are comprised of these voices.

Much of the research in the field of vocal development, while not specifically targeted at the changing voice, is nevertheless applicable to adolescent voices. Vocal abuse in adolescents is of great concern to laryngologists and voice teachers. There is considerable controversy over the issue of choral singing for adolescents, and the age at which voice training should begin.

Choral directors, in most cases, provide the only vocal instruction adolescents receive. Many authors advocate systems of vocal development which could be useful as components of the choral rehearsal. Most of these systems involve some sequence of vocal development and exercises for improving the voice.

There is some disagreement over the ability of amateur singers to be interested in or to absorb technical information about the voice and the vocal development process. While business and industry have accepted knowledge and its application as a more efficient method of learning skills and completing tasks, imagery is still accepted by many voice teachers and choral directors as the most appropriate method for vocal instruction.

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Voice Mutation in Adolescents

The period of adolescence is marked by extensive physical growth. The larynx grows along with the rest of the body. Biological measures of growth, such as crown-heel length, were found to be significantly better predictors of laryngeal growth than was chronological age. The growth of the larynx was found to be linearly related to growth in body height (crown-heel length). This suggests that laryngeal growth may not be laryngeal specific, but related to growth in height (Kahane, 1975). Joseph (1965) suggests that vocal growth probably correlates most highly with skeletal development.

Male laryngeal growth is greater than that of females, but both do become larger. Kahane (1975) found that, in general, there were no significant differences between prepubertal male and female laryngeal measurements. By puberty, male laryngeal measurements were significantly greater than those of females, and most adult gender differences in laryngeal measurements were present.

Since the larynx enlarges with the rest of the body, everyone experiences voice mutation (Harrison, 1978). The changes in the length and thickness of the vocal folds bring about voice mutation in all adolescents. At puberty, the vocal fold length of females increases by three to four millimeters, while that of males increases to approximately one centimeter (Adcock, 1987).

Voice mutation is not limited to adolescence, but is intensified during this period. The process of mutation is developmental, not abrupt. Mutation, which starts in early childhood, continues past adolescence. The problems associated with growth and development toward maturity are intensified during the junior high school years (Mayer & Sacher, n.d.).

Voice Mutation in Males

Irwin Cooper (1967) discovered three stages of voice mutation in the adolescent male. He used the Italian word *cambiata* (changing) to label male voices in the process of mutation. Cooksey (1977a, b, c) found five stages of voice mutation in the adolescent male. Barresi (1986) found three with some substages. Other researchers who worked with the stages of adolescent male voice mutation were Rutkowski (1981), Coffman (1987), and Johnson (1988).

Blatt (1983) found that a program of selected vocalises, systematically administered by a singing teacher supported by an otorhinolaryngologist, produced significant improvement in the singing ability of adolescent male singers. The purpose of his seven-year study was to determine whether the period of voice mutation could be successfully bridged by a training program which would enable continued development of the singing voice without damaging the maturing structures of the vocal mechanism. He found no breaks in the voices of any of the participants in his study. He also discovered that the singing range of male changing voices was greater than is usually ascribed to them.

Many authors have advocated that adolescent male voices must have singing materials specifically tailored to their vocal ranges in order to protect them from misuse. The research of Irwin Cooper (1950, 1953, 1967), Swanson (1960, 1961, 1973, 1977), Cooper and Kuersteiner (1965), and Collins (1981, 1982, 1987a, 1987b) was concerned with the development of choirs comprised wholly or in part of adolescent male voices in all stages of mutation, and with the availability of quality materials for such choirs. Collins, working from Cooper's research, developed the "Cambiata Concept" (1982, pp. 5-9). His own research led to the founding of The Cambiata Press, whose purpose was to publish and disseminate choral materials for use by middle school and junior high school male and mixed choirs. Adcock (1987) found, in working with adolescent male singers, that calling the high

male voice "junior high tenor" and having these singers read the treble clef an octave lower, produced successful results, both in quality of sound and in the satisfaction of the singers.

The research discussed above indicates that it is possible, with careful planning and attention to the problems of voice mutation, to help adolescent males sing through the voice change with few difficulties. The choral director must recognize the limitations of each stage of voice mutation and create an exercise program which will help the voice develop properly. Choosing the correct voice part for each singer, and suitable material for the choir to sing, is also important. When serious problems with individual singers are encountered, it may be advisable or necessary to consult a laryngologist.

Voice Mutation in Females

It was long assumed that females' voices did not change, but merely developed. Ayers and Roduner (1942) stated that girls' voices do not present difficult problems as do boys' voices during adolescence, and that the female voice matures and settles into adult quality and type, losing its childlike quality and taking on a heavier, more vibrant timbre. Gehrkens (1936) found the female's change to be more gradual and not so extensive as the male's, so that it did not entirely disrupt the singing voice. He stated that females can usually sing through voice mutation, often not aware of changes in their voices. Huls (1957), on the other hand, states that female voices do undergo mutation during adolescence.

Because females' larynges and vocal folds do not grow as much as those of males their mutation may be less dramatic (Harrison, 1978).

> This means that the girls [sic] voice change may be less dramatic than the boy's, often unnoticed even by the girl herself. Perhaps it would be better to say

> unidentified by even the girl herself. Still, the symptoms may be there; an insecurity of pitch, missing notes with varying frequency, the development of noticeable registers, or the shifting of register breaks. Perhaps the choir member just doesn't feel like singing, a very unusual phenomena for her. Girls who have sung soprano with great pleasure may find herself [sic] uncomfortable in that part. After a time the new part does not seem right, so back she goes to the original part again. A low voice may switch to soprano and then again to alto. The changing girl's voice does not always finally settle into a new range as can the boy's. Rather it often seems to be making choices for ultimate placement. (p. 14)

The female voice during mutation displays observable characteristics, which are the results of muscular immaturity and increased muscular growth. Alderson (1979) found the characteristics of the female mutational voice to be thin and breathy, low and husky, and inconsistent in quality. Similarly, Hoffer (1983) found adolescent female voices to be breathy and thin in tone quality due to muscular immaturity and lack of vocal development. Gackle (1987) found that the female voice has inherent characteristics which manifest themselves during mutation. These include:

a. breathiness of tone,
b. hoarseness,
c. incomplete phonation,
d. shifting of register breaks, and
e. "cracking in the voice" (p. 1).

In her 1991 study, she found the symptoms of the female adolescent voice change to be:

a. insecurity of pitch,
b. the development of noticeable register breaks,
c. increased huskiness,
d. decreased and inconsistent range capabilities,
e. voice cracking,
f. hoarseness, and
g. generally uncomfortable singing or difficulty in phonation.

During voice mutation, weaknesses in the interarytenoid muscles become apparent in the form of breathy tone quality, inconsistency with registers, hoarseness, cracking, and a decrease in basic range (Huff-Gackle, 1985).

Ingram and Rice (1962) found adolescent females showing loss of high range, strain, and a heavy, breathy, or rough tone quality. They discovered that not every female has problems. They suggested several steps to ensure easier and more enjoyable singing during voice mutation. These included maintaining good posture, using correct breathing, developing a vital tone, and refraining from forcing the voice and over-loud singing.

Lovelace (1964) found that during mutation the female vocal folds thicken. The tone becomes breathy and diffused, and the voice has a narrow range of effectiveness. Williams (1990), in a study involving both adolescent female singers and adult female general music, voice, and choral teachers, found that the adults, when they were adolescents:

a. preferred singing high pitches (including solos and descants), but were asked to sing alto or play the piano because they could read music,
b. knew their voices were in a state of transition,
c. had a higher range than their peers,
d. felt a loss of control over their voices at times,
e. experienced huskiness and/or breathiness in their singing and speaking voices, and
f. had frequent sore throats.

Barresi (1986) found that the adolescent female voice goes through two stages during mutation. As mutation continues, the huskiness and lack of vocal agility disappear. By the eleventh grade, register changes, for most females, should begin to develop.

In her 1985 study, Huff-Gackle defined three stages of development for the adolescent female voice. Gackle's 1991 study confirmed much of her earlier work. There were some

changes in nomenclature and age ranges for some of the stages.

Following menarche there is a significant difference in the way female singers describe their voices. Williams (1990) found that post-menarcheal females began to show a preference for singing high or low tones. They were more able to provide descriptors for their preference than pre-menarcheal females. Her study also showed that post-menarcheal females had more trouble singing up to their highest terminal pitch than pre-menarcheal females. She believed it was because they did not know how to make the transition from chest register to head register. Also, they had not experienced very high pitches with their "new" voices. Williams cited the need for more study related to females' self-perception of their singing and speaking voices, including the need to develop better descriptors.

These authors agree that choral directors and voice teachers must learn to recognize the characteristics and stages of the female voice during mutation, and help adolescents sing through the period of voice change with as little difficulty as possible. These authors also believe that choral directors who conduct young adolescent voices must understand the strengths and limitations of the voices in their choirs.

Singing as a Physical Activity

Adolescents must learn to use their voices properly. Since the choral director is the only voice teacher most adolescents ever see, he or she must be able to train these voices while understanding and working within their limitations. Huls (1957) believes there is a strong tendency to overestimate the potential of young singers. Choral directors, voice teachers, and others who are responsible for adolescent singers must understand what is normal for the age group as well as the stage of development of the individual singer. Huls found that adolescents are able to develop

their singing voices as long as teachers respect the physical, mental, and emotional capacities of their students.

Singing has often been compared to athletics because muscles are involved in both activities. Since singing is a muscular activity, and singers use their voices in much the same way athletes develop their skills, training for the adolescent singer is as necessary and proper as is instruction and practice for young athletes. Alderson (1979) concluded that singing is an athletic endeavor, and the singer is an athlete, because she is involved in muscle development and conditioned physical response to stimuli which demand daily practice. Ingham and Keaton (1983) referred to singers as "laryngeal athletes" (p. 6). The intensity and duration of daily practice sessions need to be controlled by teachers and choral directors just as they are controlled by coaches in youth sports programs (Mayer & Sacher, n.d.).

Singing and athletics both involve skill development. Phillips (1985, 1986) asserted that singing is a skill, and that if young children are not taught singing skills correctly they will learn incorrect habits which will hinder their development. He concluded that, since members of boy's choirs and children's choirs do not suffer as a result of vocal training, no child would be harmed by vocal instruction if it is done correctly. Children misuse their voices on the playground and through singing with no instruction. It is far better to teach them to sing correctly. In order to do so, choral music educators at the college level must develop a course in vocal pedagogy for the young voice. With proper guidance and care adolescents can safely sing through the pubertal years (Phillips & Fett, 1992).

The Classification of Adolescent Female Voices

The practice of permanently assigning young adolescent females to the soprano or alto section can be vocally

harmful. Skoog & Niederbrach (1983) stated that voice classification is an ongoing process, since the real voice does not emerge until the singer is taught to use the whole voice properly.

The coordination of head and chest voice is essential for good singing, provided the head voice is dominant (Bradley, 1975). In less-skilled singers of any age, the upper voice is usually weaker than the lower voice. Adolescent singers must be taught to blend the two voices in order to achieve vocal strength through the entire range. The danger in having females sing alto in junior high school is that by ninth grade they tend to use the lower register exclusively (Mayer & Sacher, n.d.). If they use the upper register at all, they have developed a significant break between the registers. Collins (1982) agreed with Mayer and Sacher's findings. He found that college-age and adult female singers with a marked division between their chest and head voices had been, in most cases, assigned to the alto part as adolescents, and had never learned to sing above A4. In many cases, they did not know they could sing above that pitch. The problem was worse if the singers were cheerleaders, since they were taught to yell in their chest voice.

In her 1987 study, Adcock found only one female with true alto quality out of 600 young adolescent female subjects tested. Hoffer (1983) also found few true altos among young adolescent female singers. Most of the singers he encountered were second sopranos. Ingram and Rice (1962) found no adolescent contraltos. They observed a tendency for children in grades four through six to sing in their lower voices with pushed volume. They stated that no young voice should be asked to do more than is good for it, either in volume or in extremes of range (upper or lower). The lower register, sung forcefully and loudly, is not any child's natural voice (Thurman, 1988). Even in ninth grade, the

female voice is still developing and must be treated with care.

All female voices during adolescence should be referred to as "light soprano" or "rich soprano" (Gackle, 1991, p.21). The presence of a prominent lower register should not be confused with true (adult) alto quality. All adolescent female singers should be vocalized through their entire ranges.

Choral directors should not classify voices permanently. Thurman (1988) stated that once a singer's voice is classified, he or she becomes that classification, sometimes for life. "Labeling is disabling" (Ginott, 1972, p. 100). The diagnosis may become the disease.

Being labeled an alto at ages eleven to fifteen can cause permanent vocal damage as well as decreasing the overall vocal range of the singer. Gackle (1991) believed young girls were assigned to sing alto because:

a. they read music well,
b. they had a good musical ear and could sing harmony easily,
c. it suddenly became difficult or "hurt" to sing soprano,
d. it was easier to sing low (chest voice); the singer could produce more volume with less work, and
e. singing along with the radio or recordings lends itself to this register.

Harris (1987) found that most females were assigned to the alto section because they had good pitch matching skills or could read music well (due to lessons on the piano or other instrument, or because of some other previous musical experience). After the vocal pattern has been established, it is very difficult to break the habit of carrying the chest voice into the upper register. Eventually it becomes impossible to move to the top (head) voice without intensive and patient studio training.

Since adolescent females are neither true altos nor true sopranos (in the adult usage of these terms) there remains the problem of assigning them to voice parts for the purpose of singing in choirs. This can best be solved by avoiding permanent classification. No young adolescent female should be assigned permanently to an alto or soprano section. Because of the lack of true alto voices in the adolescent years, Adcock (1987) advocates dividing all the females in the junior high school choir by age and previous musical experience into two even groups, and labeling them Soprano I and Soprano II. These groups alternate singing the soprano and alto parts every other song. She found that this procedure not only allowed the singers to exercise their full vocal range, but also created senior high school choristers who were better musicians. Another researcher who advocated dividing female singers evenly into two sections and alternating parts was Collins (1982). In his Cambiata Press music Collins frequently placed the melody in the second soprano part, and gave the first sopranos a descant or countermelody. Irwin Cooper (1953), Cooper and Kuersteiner (1965), Busch (1973), Skoog and Niederbrach (1983), and Huff-Gackle (1985) all agree with the practice of avoiding permanent classification of young adolescent female voices by alternating between soprano and alto parts in choral singing.

Ehret (1959, p.35) suggested the use of "travelers"--selected members of each section who shift to another section when necessary in order to achieve the desired balance and/or color. This prevents the problem of a section or an individual singer having to "make" too much volume.

If it is necessary, for any reason, to classify adolescent female voices, the traditional criteria of pitch range in singing or speaking, voice quality, register transfers, and ability to sing harmony easily should be rejected (Thurman, 1988). Williams (1990) found that tessitura is a significant predictor of most appropriate classifications for adolescents. Classification involves

identifiable factors of which tessitura is especially important (Wolverton, 1988).

Several authors condemn the use of adolescent female tenors. Having females sing tenor commits them to a frustrating vocal future (Huls, 1957). At the very least it results in months of remedial vocal work in college. Ingram and Rice (1962) also found no good purpose served in assigning females to the tenor section. The middle register (C4 to C5) is the most damaged by having females sing tenor (Mount, 1982).

The work of these authors suggests that all young adolescent females should be considered to have soprano voices. Even if the lower part of a singer's range seems to predominate, she should vocalize throughout her entire range. Opportunities should be provided for her to sing both soprano and alto parts, allowing her to use her full range, as long as the tessituras of those parts do not place undue strain on her voice. Excessive singing in the higher part of the range should be avoided as well as singing entirely or excessively in the lower register. It is wise to avoid permanent classification of a young adolescent female's voice. Her development as a singer will be much more natural, complete, and free of trouble if she is allowed to use her entire range in choir singing and in vocalization.

Vocal Models

Adolescents need to be guided as much as possible in their selection of vocal models, since the selection of inappropriate vocal models may lead to serious vocal problems. If a singer adopts a vocal model, whether positive (one she wants to emulate) or negative (one she wants to avoid), she will not fulfill her own vocal potential (M. Cooper, 1970). Most individuals are not aware of the vocal images they choose or reject, so they are not aware of the negative consequences of misusing their voices in that way. Cooper also found (1982) that poor or inappropriate vocal

models lead to an inappropriate vocal image (a combination of vocal elements-pitch, tone, focus, quality, breath support-which a person uses to form the voice she likes). This in turn leads to the wrong vocal identity (the total sound, which the person feels is his or her correct voice) for that singer.

When a singer tries to emulate a model, she acts on what she hears on the outside (Alderson, 1979). She cannot match that sound because she hears the sound from the inside of her head. She must trust her teacher's ability to hear and evaluate her voice correctly and successfully.

The majority of researchers in music education advocate having elementary children sing in their head voice (Williams, 1990). Young singers should not use their lower speaking voice for singing at a dynamic level which would involve excessive force However, this is what they hear on the radio and television, on recordings, and when adults speak to them. Adolescent female singers tend to imitate the low chest voice of some singers, and the "belt" voice of others (Boardman & Alt, 1992).

These authors agree that choral directors and voice teachers who work with young adolescents must provide vocal models to counteract those their students will tend to adopt from radio, television, and recordings. They must find ways to influence young adolescents to value the kind of tone quality which will allow them to use their voices properly.

Vocal Abuse

Many of the activities of children and adolescents, including the use of the speaking voice, make them prime candidates for vocal abuse. Because young adolescents' life styles put them in danger of abusing their voices, all choral directors and voice teachers who work with them must have sufficient knowledge about the voice to help their singers establish healthy vocal habits.

Stoer and Swank (1978) found that vocal nodules occur more frequently in women than in men. They believe every beginning voice student should be examined by a laryngologist in order to discover if any voice pathology exists, to find any structural abnormality, and to have a baseline of the vocal folds under normal conditions as a point of comparison should illness or pathology develop later.

Brodnitz (1953) agrees that systematic voice training and frequent examinations by a laryngologist are necessary as preventive voice care. One cause of hyperfunction (too much force in the use of the voice) is the lack of voice training in the schools, coupled with the tenseness of life and the competitive spirit in society. He found that hyperfunction eventually leads to hypofunction (weakness in voice production) when the muscles can no longer stand the strain.

Mount (1982) also found that hyperfunction leads to hypofunction. Overuse may cause loss of the upper tones of the voice due to weakness. Howard (1923), Appelman (1967), White (1975), and Teter and Gray (1985) all stated that children and young adolescents are in danger of abusing their voices. This is due to misuse of the singing voice as well as the overuse of the speaking voice at loud and boisterous levels.

The influence of popular vocal models on the speech habits of females was studied by Linke (1953). He found that female speaking voices show less frequency range and pitch variability than corresponding groups of male voices. His female subjects also employed median frequency levels located lower in the sustained tone range than males when speaking. He concluded that women in general tend to use median speaking pitch levels lower than would seem advisable for the most effective use of their voices. Linke concluded that the tendency for females to speak with unduly lowered pitch levels was due to social pressures, including the preponderance of low-pitched voices among female personalities of radio, movies, television, and stage.

Linke found three important detrimental effects of females speaking too low in their pitch range. The expressiveness of the female speaking voice is lessened because of the reduced frequency variability associated with a lowered pitch level. Females experience increased incidences of hoarseness due to using an abnormally low speaking pitch (raising habitual speaking frequency results in improved voice quality). There are increased injurious effects due to vocal strain, such as vocal abuse, contact ulcers, and nodules.

Morton Cooper (1982) also found that females may damage their singing voices by misusing their speaking voices. Bravender (1977) found that cheerleading encourages vocal abuse. Long-term (three years or more) cheerleading results in statistically higher vocal dysfunction and loss of clarity in the voice. Bravender found two characteristics of vocal abuse: overuse in duration, force and range; and faulty production techniques. Vocal abuse leads to vocal dysfunction. This may take three forms: vocal strain, permanent muscular atrophy, and vocal nodules.

Ingham and Keaton (1983) agreed that cheerleading, along with vocal jazz and singing in musicals, were likely to cause vocal abuse and nodule development. The hard glottal attack is also a frequent cause of nodules. Female rock singers who force their chest voice above A4 are candidates for nodules. This practice will at the very least produce hoarseness and breathiness.

Because of the mutational chink, young adolescent female singers should not use tension to achieve a firm, clear tone since it may lead to vocal abuse. A slightly breathy tone with an even vibrato is preferable to a clear, strident sound with no vibrato (Doscher, 1991). The latter sound will tend to be slightly under pitch, and may damage the voice over time.

The speech pathologist and music teacher, working as a team, are considerably more effective in identifying children

with vocal problems or vocal abuse, in educating classroom teachers in proper voice care, and communicating with parents (Andrews, 1986). If hyperfunction is habitual, it will feel normal to the person. In his work, Andrews spoke about nodules and the negative vocal behaviors associated with them:

a. hoarse, breathy phonation,
b. low pitch level (speaking and singing) for age and gender,
c. voice clearest when phonating loudly, poorest when soft,
d. voice clears somewhat in upper part of pitch range,
e. there is a restricted pitch range, and
f. hyperextension of head and neck.

Andrews also believes that since there are few full-time speech clinicians in schools, the choral teacher is in the best position to help students' develop good vocal health habits.

Developing the Voice

The Choral Director as Voice Teacher

The choral director must be able to function as a group voice teacher, and must understand vocal development as well as the limitations of the voices in his or her choir. Many directors are uninformed, unskilled, or uncommitted to the vocal development of their singers. "Directors who choose to ignore vocal development for their choirs are committing a disservice to the choristers' musical education" (Corbin, 1986, p. 2). McKinney (1982) stated that vocal faults left uncorrected by the teacher will eventually be accepted by the teacher.

The amateur singer is more concerned with singing than with making beautiful music. "It is too easy to sing, but it is a difficult task to sing well" (Swan, 1973, p. 6). A special kind of teaching is essential for the development of adequate choral tone.

Choral directors must possess thorough, practical knowledge of vocal production and pedagogy (Robinson & Winold, 1976). They must be able to demonstrate correct vocal techniques at least satisfactorily. They do not need to be great vocal artists, but need to be able to isolate, evaluate, and correct any vocal problems they hear (Heffernan, 1982). To accomplish this, Heffernan suggests that choral directors study voice as well as sing in good choirs.

Choral directors must remember they are responsible for the vocal health of every member of their choirs (Robinson & Winold, 1976). A satisfying choral experience depends on the vocal freedom of every singer. Taking a vocal approach to choral conducting involves devoting part of every rehearsal to vocal development. The rehearsal becomes, in part, a group voice lesson.

Voice building exercises need not be limited only to the warmup period (Tovey, 1977). They can and should be used whenever a problem occurs.

The choral director must be able to recognize when tone is properly produced (White, 1975). Swank (1978) suggests the choir director learn to look at singers as well as listen to them. Problems involving posture and tension will be visible as well as audible.

No voice should suffer damage as a result of singing in choir.

> Unless a choral conductor makes himself cognizant of the principles of voice production his choral groups will be limited in what they can sing well... The choral conductor must understand how to increase the dynamic potential of the singers without injuring the voices... Voice production is the same for solo and choral singing.(H. R. Wilson, 1959, p. 160)

It is necessary to develop a sequential program for teaching adolescent singers to sing properly. A concise source of practical vocal pedagogy is needed for choral directors (Decker, 1975). The choral rehearsal is often the

only place for choral singers to learn vocal technique. Fiocca (1986) found that exemplary choral directors:

a. begin rehearsals with warmups,

b. teach good, healthy vocal usage regarding breath support, tonal placement, intonation, pronunciation, and articulation,

c. know how to deal with voice mutation, and

d. evidence good vocal pedagogy in that their choirs produce "fine quality sounds." (p. 80)

The Aims of Vocal Instruction

Vocal instruction in the schools is a distinctly American idea. School music in the United States was founded on the principle that children need to know how to sing well. The idea that the average child could be trained to sing probably originated in America (Rich, 1946). This was the basis for Lowell Mason's belief (1837) that music should be included in the curriculum of the public schools. Unfortunately, music educators seem to have lost sight of that aim in recent years.

Bartholemew (1946) believes that a major step forward in vocal education will occur when we begin to train voices at an early age. It is important to build the instrument first. Children should be taught early to use their voices properly when singing (Curtis, 1895). Curtis found there are no incurable monotones. Everyone with normal speech and hearing can learn to sing.

> We know that the ear hears what habit has trained it to hear or a near approximate thereto. Hence, no student will hear or can hear what the teacher does until he has been trained to do so; and much of this ear training will depend finally on his developed ability to reproduce what is to be heard. (Russell, 1931, pp. 246-247)

Teaching children to use their voices properly has been shown to be an effective means of helping uncertain singers match pitches more accurately. Vocal coordination

instruction seems to show more promise of helping uncertain singers than pitch discrimination instruction (Aaron, 1992, 1993). Vocal coordination instruction proved effective in improving the pitch accuracy and vocal range of children in grades four through six. Collins (1981) found that the inability of singers to match pitches was the result of a lack of understanding about the singing voice. Tests show a strong correlation between untuneful singing and voice production difficulties (Joyner, 1969).

More accurate pitch matching is not the only result of teaching children how to sing correctly. Developing the child and adolescent voice also leads to more normal speech habits, better vocal hygiene, and less vocal abuse (Gackle, 1987).

The most effective method of teaching children and adolescents to sing involves vocalises designed to help the voice sound free and natural. Alderson (1979) stated that the voice should be unforced, natural, and flowing. It should be produced so that the singer looks and sounds comfortable. This sense of comfort must be conveyed to the audience.

A program of selected vocalises, systematically administered by a singing teacher, supported by an otorhinolaryngologist, produced significant improvement in the singing ability of children (Blatt, 1983). Vocalizing should enable singers to:

a. sing comfortably through a range of at least two octaves,

b. sing with accurate intonation,

c. produce an effective vibrato,

d. maintain a steady, controlled vibrato,

e. resonate all pitches effectively,

f. change the coloring of vowels without disturbing other qualities of tone,

g. sing with dramatic intensity,

h. sing with some measure of agility, and

i. maintain stamina and vocal "freshness" (Guthmiller, 1986. p.14).

Vocal instruction should begin at the latest in the late elementary grades, so students can have some security going into adolescence (S. Miller, 1985). Proper use of the vocal mechanism is not taught thoroughly enough in either health or music classes. Miller stated that there needs to be a sequential vocal training program to accompany and complement the song literature used in elementary schools. It will also help children learn to take an interest in their voices. Wassum (1979) stated that vocal development should be encouraged as a conscious goal of school music programs.

The Sequence of Categories in Vocal Development

Vocal instruction must follow a sequence in order to be effective. Although there is some disagreement on the sequence in which vocal principles should be taught, it is possible to establish an order which can be supported by the majority of research in the field. Aaron (1992) stated that the sequence should be posture, breath management, phonation, and resonance. Collins (1981) agrees that posture and breathing are the first two topics to be addressed, followed by tongue position. Corbin (1986) advocated posture, breathing, tone quality, blend, and intonation as the proper sequence. Decker (1975) agrees on posture and breathing, but adds relaxation, resonance, and diction. Ehmann (1968) also begins his sequence with posture and breathing, but groups all other topics under the general heading of choral voice training. Gackle (1987), speaking specifically about adolescent female voices, advocated posture, breathing, phonation, registration, and resonance as the sequence in which the topics should be taught.

Garretson (1985) begins with posture and breathing, followed by deep-set vowels and an open throat. Hoffer (1983) produced a similar list, consisting of posture,

breathing and a relaxed throat. Howard (1923) spoke of posture, breathing, and tone formation. Heffernan (1982) stated that there are three elements of vocal technique: a steady, constant, controlled supply of air; a relaxed, coordinated set of neck, throat, jaw, and facial muscles; and resonance (which, he believes, usually followed naturally if the other two elements were developed).

Gallagher (1978) proposed that exercises and vocalises should stress relaxation, breath control, phonation, resonance, range, and articulation. G. Wilson (1991) stated that respiration, resonation, and registration were the components of a proper sequence of vocal instruction. McKinney (1982) classified vocal faults according to their relation to the physical processes of respiration, phonation, resonation, and articulation.

Phillips' (1986) sequence includes respiration, phonation, resonant tone production, diction, expression, and ear training. Robinson and Winold (1976) stated that posture, breath control, and bridging registers is the proper sequence, while Roe (1987) advocated posture, breathing, and pronunciation. Vennard's (1967) sequence begins with breathing (under which he includes posture), followed by attack (phonation), registration, resonance, vowels, and articulation. He believes the last step in the sequence is coordination of all the elements.

Westerman (1955) states that students can find freedom in singing through the patterning and conditioning of the normal actions of posture, respiration, phonation, resonance, and articulation into a blended whole.

> Without good (1) posture, (2) respiration (breathing) cannot be efficient for singing purposes. Without controlled respiration, (3) phonation (tone production) cannot be clear. Without clear phonation (4) resonation (the resounding of tone vibrations within the cavities and from the bony structures of the head) cannot be full, and free from muscle interference; and without full and free resonation, (5) articulation (the pronouncing of words) cannot be accurate and distinct. There is no escape from this framework.

Posture is its foundation and articulation is the end product. (pp. 3-4)

Based on the above statements, the most logical and effective sequence for teaching vocal principles to young adolescents would seem to be

a. posture,
b. breath management,
c. relaxation,
d. phonation,
e. resonance,
f. registration, and
g. articulation.

This sequence might need to be modified for individual singers, or for groups of singers in other age groups. There are two reasons for its value in working with young adolescents. First, it follows Westerman's suggestion of beginning with the large skeletal muscles (posture) and working sequentially to smaller muscles. Second, it adds "relaxation" as a step between breath management and phonation. Since young adolescents' life styles are so active, the relaxation of muscles which interfere with free phonation would seem to be a necessary component of a vocal instruction program for this age group.

Posture

Posture forms the basis for all vocal development. If the instrument is to be used efficiently it must be held correctly. "Before learning to play any instrument one should learn how to hold it" (Vennard, 1967, p. 19). Mabry (1992) also advocated learning how to hold the instrument first. Tall ribs, a tall neck, and "leaning up" are better methods of eliminating tension than telling singers to stand up straight (p. 310). A forward head position deactivates the work of the depressor muscles (those used in yawning), and emphasizes the work of the elevator muscles (those used in swallowing). The depressor muscles lower the larynx, which is the position best suited for relaxed, easy singing.

The elevator muscles raise the larynx, To counteract any tendency to push the head forward, Mabry suggested thinking of "balancing a basketball on a broomstick" (p. 31). Gehrkens, (1936), Decker (1975, 1977a), McKinney (1982), Barresi (1986), Corbin (1986), R. Miller (1986), and Herman (1988) all agree on the importance of erect but flexible posture as the basis of good vocal technique. Vennard (1967) suggested having the student ask herself, while looking in the mirror, "Would I pay money to look at that?" (p. 19).

Breath Management

Breath is the motor of the singing mechanism. No sound can be made in the human larynx without breath. Breath management is the process by which air is used most effectively for the sustained sound needed for singing.

Breathing involves expansion of the rib cage at the sides, in front, and in back (Huls, 1957). There is too much upper chest and shoulder movement in adolescents. They must learn that breathing for singing is as natural and free as breathing for life. Ehmann spoke of the "breath ring" (1968, p. 16), and agrees that expansion should occur at the sides, in front and in back. Vennard advocated the sensations of "in," "down," and "out" as being representative of proper breathing. The singer breathes in (through the nose and mouth), down (into the lungs), and out (the walls of the thorax expand).

The singer must not exaggerate the intake of air (R. Miller, 1986). If she crowds the lungs by taking too much air, a quicker rate of expiration will occur. The singer should take an easy breath and replenish the air she has used. Instead of yawning (which leads to tension at the end of the yawn) inhale as though smelling a rose. This will give the singer a feeling of an open (relaxed) throat (pharyngeal cavity). Miller also believes that the key to success in the female chest voice range is not more force,

but more support. In his studio teaching Hartwell (1992) refers to relaxed, easy inhalation as a "singer's breath".

Doscher (1987) stated that two to three pints of air are sufficient to sing the longest musical phrase (fifteen to twenty seconds). Since the lung capacity can be as much as four quarts during deep breathing (the breathing used for singing), it is not necessary to inhale to the point of crowding the lungs. Efficiency is more important than capacity. The singer's object is to keep the ribs up and out so the abdominal muscles can sustain their leverage for steady expiration. Any attempt to control the movement of the diaphragm will result in unnecessary and undesirable muscular tension in the breathing apparatus, which will have a negative effect on the tone quality. Too much air support in order to achieve a larger sound, especially through the immature pharynx of the young adolescent singer, will tire the throat muscles and produce tension in the tongue and soft palate (Doscher, 1991). This will lead to faulty intonation, and eventually, to serious vocal problems such as chronic hoarseness and vocal nodules.

Vennard (1967) advocated rib breathing and abdominal breathing over chest breathing. He stated that chest, or clavicular breathing is used by out-of-breath athletes. During this type of breathing phonation is uncontrolled. Vennard found that, for the most part, women are "chest breathers", and men are "belly breathers" (p. 27). He advocated having the singer place one hand on the ribs and one hand on the abdomen to check for rib and abdominal breathing. He also suggested that breathing be practiced while lying on the floor with a book or books on the abdomen, just below the ribs.

Howard, 1923), Christiansen (1952), Brodnitz (1953), Westerman (1955), Christy (1961), Roe (1970), Swan (1973), Decker (1975, 1977a), Swank (1978), Alderson (1979), McKinney (1982), and Barresi (1986) all agree that breath support or management is important for free, relaxed singing.

When breath is totally responsible for the support of the voice (no pressure from the jaw, shoulders, eyebrows, or neck) the result will be free, flexible, singing (G. Wilson, 1991). The quality of the voice depends upon the quality of the breath just taken (Boardman & Alt, 1992).

Throughout the research cited above, various terms have been used by authors for the act of respiration as it is applied to singing. Some of these are "support", "control," and "pressure." Corbin's (1986) use of the term "breath management" (p.5) seems to be the most representative of the actual act of respiration which the process of singing requires, although the term "support" is useful in discussing the work of the "breath ring" during phonation.

Relaxation

In order for the vocal mechanism to produce a free and natural tone, there must be a feeling of relaxation in those muscles in which the presence of tension might impede correct singing. The secret of normal voice function is not the relaxation of all muscles, but the use of the correct muscles with the correct degree of tension (Brodnitz, 1953). The majority of voice problems are the result of exaggerated muscle activity. Roe (1970) agrees with Brodnitz that faulty use of the vocal mechanism is responsible for most vocal problems--specifically, poor intonation. Vennard (1967) suggested having the student feel as if she were a rag doll to encourage the release of unnecessary tension, letting the body relax completely before assuming an effective singing posture. The right way to produce tone is the easy way (Christy, 1961).

Howard (1923), B. Taylor (1936), and Decker (1975, 1977b), all emphasized the need for the release of unnecessary tension in order to produce a relaxed, free singing tone. A relaxed tongue and a movable lower jaw will allow the muscles of the throat to function properly.

Phonation

Only when the muscles involved in the vocal mechanism are free to function properly can accurate, natural phonation occur. Phonation should be free and easy, with no unnecessary tensing of muscles to produce a sound. There is no conscious feeling of muscle action in the vocal ligaments (Westerman, 1955).

Correct vocal fold position for the commencement of phonation cannot be achieved through conscious effort (R. Miller, 1986). Breath activates the vocal fold vibration. The correct release of tone (cessation of phonation) will prepare the singer for proper onset of the next tone. "Sing in the position of breathing--breathe in the position of singing" (p. 25). Miller stated that the student should be encouraged to sing as she speaks. This involves acoustic mobility of the jaw, tongue, and lips. Any sensation in the larynx probably means tension in the larynx. If the larynx is properly relaxed there should be little or no sensation. The natural wider opening of the mouth to accommodate higher pitches will accomplish most of the necessary vowel modification. The singer must not use muscle tension. Vennard (1967) agrees with Miller on the use of a breathy "H" to eliminate the glottal stroke.

Resonance

One of the most serious mistakes young singers can make is that of substituting volume for resonance. Young voices need time and maturation to develop a resonant sound. It is difficult to achieve consistent sensations in rapidly growing resonators. Most authors advocate some form of humming for resonance (Roe, 1970; Decker, 1975).

McKinney (1982) categorized resonance faults as the result of overemphasis on a specific resonator. If the sound is too bright, there is overemphasis on mouth resonance. If the sound is too dark, there is overemphasis on pharyngeal

resonance. If the sound is too nasal, there is overemphasis on nasal resonance.

Agreeing in part with McKinney, R. Miller (1986) advocated resonator coupling. Neither the mouth nor the pharynx is more important as a resonator. Both are equally important. The nasal passages are at best secondary resonators because of their lack of size. The natural position of the mouth at rest is the natural position for speaking and singing. Humming is a good exercise for developing a favorable resonance balance. The larynx must not be forced down to produce an unnaturally "dark" sound. This sound is as undesirable as its extreme opposite, the "open" or "white" sound. The student should not sing as if yawning and speaking at the same time. Proper inhalation should insure proper positioning of the larynx for properly resonant phonation.

Resonance will improve when the larynx is in a low, relaxed position. Vennard (1967) proposed three methods for lowering the larynx:

a. the inhale,

b. the yawn (the beginning of a yawn), and

c. the reflex action after swallowing.

Dropping the jaw prevents tightening the throat and raising the larynx. A mellow tone feels "down" and "back," while a brilliant tone feels "up" and "forward" (p. 120). The singer must accomplish both simultaneously. The tone must have "focus in front" and "roundness and depth in back" (p. 215).

Westerman (1955) believed that resonance relieves strain and effort at the source of vibrations (the vocal folds). He suggested that the singer should aim for a uniform amount of hum in the voice to produce resonance on all vowels throughout the total range.

Zimmerman (1968) stated that tone cannot be forced into the resonating centers. It must be freed to find its own way

there. She spoke of sensing vibration in the resonance centers.

Toms (1985) proposed an interesting technique he called "Extensity" (p.16). Extensity is the result of the mixture of acoustical elements which cause sound to seem large or small. This is related to pitch and tone rather than dynamics. He advocated having the student place a flattened hand on the upper lip, parallel with the floor, and saying or singing "OH." The sound must come only from the mouth. As the student sings successively higher pitches, no change in the tone quality should be allowed. Once the student is able to produce a resonant "OH" throughout her range, she should proceed through the other vowels. This practice will produce a larger sound (more extensity) by producing more overtones.

Registration

Many young singers, anxious to emulate the popular singers they adopt as vocal models, develop the lower register ("chest voice") in order to achieve a loud sound easily. Singing along with popular recordings forces them to use this lower register almost exclusively.

There is considerable disagreement among authors as to what constitutes a register, and how many registers there are in the voice. McKinney (1982) defined a register as a particular series of tones produced by the same vibratory pattern of the vocal cords, and having the same basic quality (p. 97).

Schoenhard and Hollein (1982) believe there are two registers, high and low. They investigated the question of a middle register and posed three possible answers.

a. the middle register is laryngeal,
b there is no middle register; it is a blend of the other two, and
c. the middle register is a vocal tract-related phenomenon.

According to their study, research supports all three hypotheses.

Brodnitz (1953), a laryngologist who has worked extensively with singers, would seem to support the second hypothesis--that the middle register is in reality a blend of the high and low registers. Brodnitz stated that there are three registers, marked by breaks which can be heard in both upward and downward scales. For females, the registers are:

a. chest register--the entire vocal cord vibrates,
b. head register--only the inner margins of the highly-tensed cords vibrate while the posterior part of the cords remain closed, and
c. mixed register (ideal for singing)--color of the opposing registers are blended; the mixture varies from equal parts in the middle to larger ratios at either end.

Vennard (1967) preferred the terms "light mechanism" and "heavy mechanism" to "head voice" and "chest voice" (p.66). He stated that there are three approaches to the problem of registers.

a. idealistic-one register,
b. realistic-three registers, and
c. hypothetical-two registers (light and heavy).

> Most beginners tend to sing either all heavy or all light. If they are conscious at all of the other register, they are schizophrenic about it. The *unused register* (a phrase I wish to coin because I think we will find it useful) is like a different personality to the beginner, something into which he [she} lapses only by accident. He [she] must be taught to use what I call *full voice*, a blending of both heavy and light quality. (p.73)

Vennard stated that the women's "unused register" (p. 76) is the chest register. In the light of more recent research into the vocal habits of adolescent female singers, it is more likely that the head register is the unused one among at least a significant portion of this group.

How to blend the registers is among the most controversial aspects of vocal pedagogy (Decker, 1975). Adding more top (light) mechanism will help young singers improve their intonation when they are learning to let go of an overly controlled voice (Doscher, 1991). This is especially helpful when combined with more air flow (support). Herman (1988) suggested vocalizing from the top down to counteract the problem of trying to force the low voice (heavy mechanism) into the upper register.

Richard Miller (1986) stated that the voice must be agile in order to produce a good, free, *sostenuto*. Working the chest voice above its breaking point results in register separation, while working the head voice down into the chest range results in register combining. Transition between the registers is accomplished by means of vowel modification.

It is important for voice teachers to train their students to sing so that the audience cannot tell in which register a tone is being produced (Schoenhard & Hollein, 1982). All female singers must be taught to blend the head and chest registers throughout the entire range (Skoog & Niederbrach, 1983). There is little range difference in well-trained voices between sopranos, mezzo sopranos and contraltos. The differences are in tone quality and tessitura.

In the adolescent female voice, the presence of two registers seems to be evident. Labeling these registers the "light mechanism" and the "heavy mechanism" would seem to be more scientifically correct than using the terms "head voice" and "chest voice." The young adolescent female voice must be trained to produce the most resonant tone possible, within the boundaries of free and natural singing, throughout the entire vocal range.

Articulation

Proper articulation involves correct vowels separated by strong but non-interfering consonants. Vowel articulation

will be emphasized in this study, since the object is to attempt to improve vocal tone, and correct vowels must precede correct consonants in any program of vocal tone development. Teaching correct vowel sounds will help clear up many vocal faults (Christy, 1961).

In addition to incorrect breathing habits and tension in the vocal mechanism, poor intonation can also be caused by misformed vowels (Corbin, 1986). Corbin suggested sustaining the incorrect vowel and gradually changing it to the correct vowel. She also advocated using a neutral vowel (designed to change the sound) in place of the text in a song or choral piece. Swan (1973) and Decker (1975) also emphasized the importance of forming vowels correctly.

The quality which differentiates consonants from vowels is the noise factor. For consonants to be recognized as such, the noise must be exaggerated. This is the essence of singing words so clearly that they can be understood in a large hall. Whispering the text eliminates the tone entirely, and emphasizes the noise factor. This lets the students know if they are producing consonants strongly enough. Chanting and intoning phrases, especially those with diction difficulties, bridges the gap from speaking articulation to singing articulation (Christy, 1961). Singing with no consonants produces a legato phrase line (Hill, 1992). Replacing the consonants will have the effect of punctuating the line rather than interrupting it.

Therapy and Exercises

The choir director working with young adolescents will, at some time, encounter voices which have been abused. An understanding of voice therapy will help the director restore some abused voices to good health. It will also aid him or her in seeking appropriate help for those voices which need the assistance of a laryngologist or voice therapist. Creating a program of vocal exercises designed to develop

voices will aid the choral director in preventing vocal abuse.

Some therapeutical measures used to help people with abused voices may also be used as part of a program of vocal instruction for singers. These include chewing, the Bernoulli effect, and feeling the larynx for signs of movement.

Chewing is useful in curing vocal nodules (Ingham & Keaton, 1983). The Bernoulli effect (flowing warm air) is also effective, as in singing "HAH," with a breathy "H," naturally and without overt muscular effort. Chewing and warm air exercises before singing helps the surfaces of the vocal mechanism stretch and condition themselves.

Stoer and Swank (1978) stated that chewing helps in reducing hyperfunction. The jaw, throat, tongue, and lips are relatively relaxed when chewing. D. K. Wilson (1972) also advocated chewing therapy for vocal problems. Chewing therapy is useful for persons who sing or speak with a tight jaw (Boone, 1971). Chewing therapy also helps voice patients find their optimal speaking pitch (Brodnitz, 1953).

For correcting problems associated with speaking at an inappropriate pitch (either too high or too low) Stoer and Swank (1978) advocate having the student place her fingers on the larynx to feel for movement. At the optimum speaking pitch there will be little or no laryngeal movement. They also suggest having the student say "um-hm" easily and naturally. If it feels different from the manner in which she usually speaks, she is probably speaking at an incorrect pitch.

The aim of vocalization is not more power but beauty and purity (Howard, 1923). High school singers, given abdominal breathing instructions and ten-minute sessions of vocalizing and tongue exercises, showed improvement in the areas of tone quality, normal vibrato, fuller resonation, and selectivity in articulation (Gonzo, 1973). Gackle (1987) suggested that

the vocalises be sequenced to help singers become aware of the feeling of the new skill.

Guthmiller (1986) stated that no vocalise has any intrinsic value. Its only value lies in its ability to elicit a specific response from singers. Therefore, exercises must be directed at particular tasks, such as breathing, vowel production, agility, tongue position, or support (Hill, 1992).

Exercises should be introduced at various times in rehearsal, not just at the beginning (Gallagher, 1978). At the high school level vocalises are highly important in effecting a particular sound (Overturf, 1985). Students should vocalize from the top down to counteract the problem of trying to force the low voice into the upper register. Women who have sung tenor, or who have forced their chest voice above the break for any reason, should use downward vocalization from the head voice coupled with pianissimo singing (Mount, 1982). They should start on D5 softly, then crescendo, proceeding downward by half steps, bringing the lighter mechanism (head voice) down as far as possible. To train the voice as well as prepare for the rehearsal, altos should be encouraged to sing with the sopranos, and sopranos with the altos during warmups (Skoog & Niederbrach, 1985). Skoog and Niederbrach agree that descending passages will produce the most significant results for both voices.

Spending too much time learning vocalises, either because of difficulty or large number, is counterproductive. Still, there must be enough exercises to avoid too much repetition. Simpler exercises allow students and teachers to concentrate on the vocal problem and the correction of the problem (Swank, 1978). A few select, basic vocal exercises, used intelligently, are more effective than an extensive list (Christy, 1961). This method saves time and effort in developing vocal technique. Aaron (1992), conversely, states that varying the musical input is more effective in helping children learn. A number of different exercises contributed

to learning vocal technique more quickly and more thoroughly. The body of exercises must be large enough to provide multiple solutions for vocal problems, and to avoid boredom, but small enough to avoid spending too much time learning exercises.

Laryngologists and voice teachers agree that adolescents, because of their life style, are prime candidates for vocal abuse. All choral directors and voice teachers who work with them must have enough knowledge about the voice to enable them to help their singers establish healthy vocal habits. This includes providing vocal models to counteract those that their students will hear on the radio and television and on recordings. The choral director must understand the principles of vocal development thoroughly enough to be able to use the choir rehearsal as a voice class. Those educators who are responsible for the development of choral music educators must develop a program of vocal pedagogy appropriate for use in the choir rehearsal setting. Perhaps audiences will also need to be educated in the correct vocal sound for children and adolescents so that they will not ask singers and choral directors to perform in a way which will be injurious to young voices.

The Application of Knowledge to Vocal Instruction

The adolescent is an individual who begins to consider herself the equal of adults, and to judge them, with complete reciprocity, on the same plane as herself (Inhelder & Piaget, 1962). She begins to plan the future, including plans to change society, on either a complete or limited basis. She changes her thinking concerning what is real and what is possible. The concrete present is only one part of future possibilities. She must work out a conception of life which allows her to assert herself, to create something new, and to be more successful than her predecessors. She tries to adapt her ego to her environment, and her environment to her ego.

Inhelder and Piaget referred to this as "cognitive egocentricism" (p. 346).

During the Formal Operations Stage (age eleven through adolescence) the person learns that she can reason, and that she can imagine many possibilities within a situation.

> At about the same time, the adolescent is undergoing cognitive changes, He is adding to concrete operations a formal operational stage. Now, the young person begins to reason about his own reasoning. He pays attention to the form as well as the content of an argument [or] proposal...He now begins to formulate hypotheses and test them. He begins to consider the unreal as well as the real in developing logical thinking (Harrison, 1978, p.15).

During these years, parents, teachers, and adult role models lose ground to peer influence and egocentric confidence. Each adolescent begins to develop her own personal value system. Since she is beginning to use her powers of reason, she will respond, in an adult-like manner, when presented with information (knowledge) which respects her intellectual achievements and which challenges her to apply her reasoning abilities.

Knowledge is used to enable people to acquire skills quickly and successfully. Knowledge (the systematic organization of information and concepts) helps people acquire new skills more quickly and more completely than through apprenticeship (experience). When people acquire a skill on a knowledge basis they have learned how to learn. Drucker (1969) stated that knowledge is becoming the foundation of skill. "Few things are as badly needed in growing up as the sense of achievement, which only performance can give" (p. 316). Drucker believed that society needs people who can use theory as a basis of skill for practical application in work.

Holt (1983) states that what makes things difficult or easy for learners' minds is how much sense they make. Any subject can be taught effectively in some intellectually honest way to any learner at any stage of development

(Bruner, 1960). Bruner stated that the act of learning includes three simultaneous processes: the acquisition of new information; the transformation of knowledge to fit new tasks; and evaluation--how information is manipulated in a correct way for the task.

Drucker (1969) stated that knowledge allows people to learn skills more quickly and thoroughly than experience (apprenticeship). By providing knowledge about the voice and the vocal development process teachers will be more effective in bringing about the desired changes in their students' singing skills. Harrison (1978) advocated educating young people about the physical development of their larynges, the lengthening of the vocal folds, and the ways in which these changes can affect singing and speaking. The teacher should explain the principles of good vocal production, providing information which will allow his or her students to understand and more effectively apply concepts in the development of their own performance skills (Henry, 1992).

The teacher must ask questions (Hill, 1992). By so doing he or she will force choristers and voice students to think about what they are doing. Responding to the questions will foster awareness in the student so she can analyze what she is doing. Junior high students will accept vocalises if they see the purpose for them (Swanson, 1961). They should be told that the exercises will stretch the voice and improve vocal skill in the same way that exercises and drills used by athletic coaches prepare players for participation in games.

The Use of Science and Imagery in Vocal Instruction

Knowledge about the vocal mechanism and the vocal development process seems to help students learn more quickly and more easily. Until this century, teaching voice by scientific principles was almost impossible, since devices used to view the vocal mechanism were at best primitive. Today, a wide range of instruments exists for viewing the

vocal mechanism, and for measuring the sounds made by the voice. Decker (1975) found that the literature on the voice written between 1960 and 1970 exhibited a more scientific approach to vocal pedagogy than vocal literature from earlier decades. Still, many voice teachers and choral directors prefer to teach by describing the sensations felt by the singer, using a vocabulary full of imagery (Ehmann and Haasemann, 1981; Daniel, 1993). The use of scientific knowledge makes it possible to accomplish vocal instruction more efficiently and more thoroughly Westerman, 1955; Vennard, 1967, R, Miller, 1986).

Swanson (1973) noted three methods of teaching voice: imitation (student or teacher as a model); mechanistic (scientific aspects of the voice); imagery (sensations or feelings described by using phrases from nonmusical fields of activity). Brodnitz (1953) stated that a choral director or voice teacher must know the scientific principles of voice even if he or she chooses to explain vocal techniques in terms of sensations. He stated that the sensation of vibration within the body is not a scientific basis for voice teaching. The sensation of vibration can, however, be used to make singers aware of the "feel" of the voice (R. Miller, 1986).

Vennard (1967) found that teaching voice by scientific principles brings quicker and better results than teaching by imagery. He believes, however, that imagery is a good teaching aid if it helps the student free the tone. Both teacher and student must realize that it is only imagery, however, and not literally true. Verbal imagery may be an important means of developing a particular vocal sound (Overturf, 1985). It is possible and sometimes advisable to get rid of strain in the voice by psychological means (Roe, 1970).

Authors such as Brodnitz (1953), Westerman (1955), and R. Miller (1986) have written extensively on the scientific basis for vocal instruction. These authors and the others

cited above agree that there is a place in vocal pedagogy for both science and imagery. The teacher must thoroughly understand the scientific principles of the vocal mechanism. He or she must decide how much of that information should be presented to students. Teaching by scientific principles has been shown to be more effective and more efficient in developing high quality voices. Imagery may be used to support the scientific approach. Both teachers and students must realize that imagery is an attempt to explain the sensations the student feels or should feel, and cannot take the place of scientific understanding.

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